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ESA selects Swiss space project

The European Space Agency (ESA) today chose a Swiss space exploration project under the direction of the University of Bern's Center for Space and Habitability for the first «S-class» mission of its science programme. The CHEOPS satellite will begin researching planets outside our solar system as early as 2017.

The ESA science programme's new «S-class» missions are designed to support innovative researchers with clever ideas capable of delivering significant results in small missions. As part of this initiative, representatives of the 19 ESA member states today selected CHEOPS (CHaracterizing ExOPlanet Satellite), a space project under Swiss direction.

«The mission was chosen from among 26 project proposals», says Alvaro Gimenez, ESA Director of Science and Robotic Exploration. «This impressive response underscores the scientific community's strong interest in missions that can be accomplished quickly and that focus on key questions in space research.»

The selection will make Switzerland the first nation to assume primary responsibility for an "S-class" space mission within ESA's science programme. «This is a fitting continuation of the 40-plus year success story of Swiss researchers and industry at the cutting edge of space research», said a pleased Willy Benz, an astrophysicist at the University of Bern's Center for Space and Habitability (CSH). Benz will lead the CHEOPS mission for Switzerland.

The winning consortium also includes the University of Geneva, a world leader in the ground-based search for exoplanets, along with the Swiss Space Center at EPFL and ETH Zurich. In addition, five other European nations, Belgium, Great Britain, Italy, Austria and Sweden, are already involved in the mission. Further countries may also participate.

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In accordance with the guidelines for the new «S-class» missions, the CHEOPS satellite will be launched into Earth orbit as soon as 2017. «S-class missions» have a development time not exceeding four years from project approval, instead of the usual ten years for larger missions. Furthermore, they must cost no more than EUR 150 million, of which ESA will contribute a maximum of EUR 50 million. The Swiss CHEOPS space project will cost significantly less, with the ESA science programme, Switzerland and the group of other participating nations each bearing one-third of the project costs.

CHEOPS will recognize Earth-like planets by their shadows

The first exoplanet, or planet in a different solar system, was discovered orbiting the star 51 Pegasi by astronomers Michel Mayor and Didier Queloz of the University of Geneva in 1995. It has since been joined by a growing number of ever smaller and harder-to-detect planets. «In Chile we have a telescope with the world's most precise instrument for discovering exoplanets by indirect location», explains Didier Queloz, a planet hunter and University of Geneva professor who is a key figure in the CHEOPS project. The HARPS detector at the focus of the 3.6-metre telescope detects planets and determines their mass using a procedure known as the radial velocity method.

CHEOPS will use a different technique, the transit method, which measures the diameter of selected exoplanets with great precision. The measurements, along with the planet's mass, can be used to calculate its density, which in turn reveals whether the planet is composed of rock, ice or gas and if it has an extensive atmosphere. Researchers are particularly interested in the properties of small planets with diameters one to six times that of the Earth. «The CHEOPS mission is a milestone on the path of researching exoplanets in the near vicinity of our solar system», says astrophysicist Christopher Broeg, project manager at the Center for Space and Habitability (CSH) of the University of Bern, enthusiastically. «It may bring us closer to the distant goal of one day discovering a planet that has characteristics similar to the Earth and might conceivably be capable of sustaining life.»

CHEOPS: small but ambitious

CHEOPS is a small satellite weighing around 200 kilogrammes and carrying a telescope 30 centimetres in diameter and 1.5 metres long. It will be launched into near-earth orbit, where it will circle above the day/night terminator at an altitude of 800 kilometres. From there, it will observe some 500 bright stars and characterize their planets over a three-and-a-half-year period.

The astrophysicists will employ the transit method in their research: CHEOPS's telescope will measure planets' diameters, or more precisely their shadow in front of the star. The process is similar to holding a pinhead in front of a light bulb: the pinhead blocks part of the light and the bulb appears darker. When the Earth moves in front of the Sun, for example, our planet's shadow reduces its brightness by only one ten-thousandth. But the CHEOPS telescope will be capable of measuring a change in star brightness that is ten times smaller. The planet's diameter can be calculated from the reduction in brightness. A different method, known as the radial velocity method, can be used to find its mass. Both methods can now be combined on selected exoplanets to determine their density and with it other properties, such as whether it is composed of rock, ice or gas and whether it has an extensive atmosphere.

For more information see http://www.cheops.unibe.ch

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